FIFTH FIVE-YEAR REVIEW REPORT FOR
HOOKER (102nd STREET) LANDFILL SUPERFUND SITE
NIAGARA COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

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LIST OF ABBREVIATIONS & ACRONYMS

AMSL	Above Mean Sea Level
APL	Aqueous Phase Liquid
BHC	Benzene Hexachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COPC	Contaminant of Potential Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
GSHI	Glenn Springs Holdings, Inc.
HI	Hazard Index
ICs	Institutional Controls
IER	Intermediate Engineering Report
IRIS	Integrated Risk Information System
LCTF	Love Canal Treatment Facility
MCL	Maximum Contaminant Level
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDWR	National Primary Drinking Water Regulation
NPL	National Priorities List
NR	NAPL Recovery
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
OCC	Occidental Chemical Corporation
PCB	Polychlorinated Biphenyl
PCOR	Preliminary Close-Out Report
PFAS	Per- and Polyfluoroalkyl Substances
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SCO	Soil Cleanup Objectives
SVOC	Semi-Volatile Organic Compound
TBC	To-Be Considered
UAO	Unilateral Administrative Order
UU/UE	Unlimited Use and Unrestricted Exposure
VOC	Volatile Organic Compound

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Hooker (102nd Street) Landfill		
EPA ID: NYD980506810		
Region: 2	**State:** NY	**City/County:** Niagara Falls, Niagara County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Aidan C. Conway		
Author affiliation: EPA RPM		
Review period: 9/27/2016 – 4/23/2021		
Date of site inspection: N/A		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/26/2016		
Due date *(five years after triggering action date)*: 9/26/2021		

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Hooker (102nd Street) Landfill Superfund site, located in Niagara County, New York. The triggering action for this statutory review is the previous FYR, dated September 26, 2016. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The site consists of one operable unit which will be addressed in this FYR.

The Hooker (102nd Street) Landfill Superfund site FYR was led by the Environmental Protection Agency (EPA) Remedial Project Manager (RPM) Aidan C. Conway. Participants included Julie McPherson (EPA) human-health risk assessor and ecological risk assessor, Liana Agrios (EPA) hydrogeologist, and Michael Basile (EPA) Community Involvement Coordinator (CIC). The Hooker (102nd Street) Landfill Potentially Responsible Parties (PRPs) were notified of the initiation of the FYR. The FYR began on September 15th, 2020.

<u>Site Background</u>

The site is located on Buffalo Avenue in Niagara Falls, New York (see Figure 1). The site borders on the Niagara River and lies less than one-quarter mile directly south of the Love Canal Superfund site, seperated by the LaSalle Expressway, as well as Buffalo and Frontier Avenues. A portion of the filled area of the site is an extension of the original Love Canal excavation. The site consists of approximately 22.1 acres; 15.6 acres are owned by Occidental Chemical Corporation (OCC), formerly the Hooker Chemicals & Plastics Corporation, and 6.5 acres are owned by Olin Corporation (Olin). Hereafter, OCC and Olin will collectively be referred to as the “Companies.” The site has restricted access and has not been put to reuse.

The site is bounded to the south by a shallow embayment of the river. A stone-face bulkhead, constructed in the early 1970s to minimize soil erosion to the river, runs along the length of the shoreline at the site. The embayment lies at the confluence of the Little Niagara River, which flows around the north shore of Cayuga Island, and the Niagara River. Directly to the west of the site lies Griffon Park, which was formerly used as a landfill for municipal waste by the City of Niagara Falls. Griffon Park is owned by the City of Niagara Falls and is utilized for passive recreational activities and a boat ramp along the Little Niagara River. Across the Little Niagara River from Griffon Park is Cayuga Island, which is a residential community. The property to the east of the site is zoned residential and currently has two waterfront residences, but is otherwise an unimproved densely brushed field. A well-maintained perimeter fence restricts access to the site. Locked fence gates permit authorized vehicle traffic from Buffalo Avenue.

The larger portion of the landfill operated from 1943 to 1971. During that time, approximately 23,500 tons of mixed organic solvents, organic and inorganic phosphates, and related chemicals were deposited at the landfill. Brine sludge, fly ash, electrochemical cell parts and related equipment, and 300 tons of hexachlorocyclohexane process cake, including lindane, were also deposited at the site. A landfill operated on the smaller portion of the site property from 1948 to about 1970, during which time 66,000 tons of mixed organic and inorganic chemicals were disposed. In addition, about 20,000 tons of mercury brine and brine sludge, more than 1,300 tons of a mixture of hazardous chemicals, 16 tons of mixed concrete boiler ash, fly ash, and other residual materials were disposed of at the site.

The immediate underlying geology at the site consists of fill deposited in conjunction with the landfilling activities described above. The thickness of the fill varies in depth from 0 to 18 feet, consisting of mixtures of silt, clay, gravel, and landfill wastes. The fill is underlain by alluvium, deposited by the Niagara River, which varies in thickness up to 32 feet. A layer of clay underlies the alluvium, generally sloping toward the Niagara River. Beneath the highly impermeable clay layer, glacial till overlies the bedrock surface beneath the entire site, ranging in thickness from less than four feet to greater than 20 feet. The uppermost bedrock formation is massive and dense dolomite, of which the majority of the porosity and permeability occurs along fracture surfaces, bedding planes, partings, and joints.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Contaminants found within the survey area during the Remedial Investigation (RI) monitoring period included heavy metals (such as mercury), chlorobenzene compounds, chlorinated phenols, hexachlorocyclohexanes, polychlorinated biphenyls (PCBs), and polychlorinated dioxins and dibenzofurans. Groundwater samples taken from the bedrock aquifer beneath the site did not contain site contaminants. Based on these findings and considering the highly impermeable nature of the clay/till layer separating the alluvium from the bedrock, shallow (overburden) groundwater does not appear to flow vertically from the site into the bedrock aquifer. Rather, the overburden groundwater discharges laterally into the embayment and across the site's eastern and western boundaries. The principal pathway for migration of contaminants off-site was via groundwater discharge from the fill and alluvium zones of the landfill into the embayment. Sediment monitoring conducted in the Niagara River showed contamination limited to an area within 300 feet from the shore.

Off-site investigations also indicated site-specific contaminants in surface soils north of Buffalo Avenue and around the property perimeter, including dioxin above the 1 micrograms per kilogram (μg/kg) action level. The risk assessment concluded that the risks were present at the site for fish consumption and direct contact with contaminated surface soils. As a short-term solution to preclude possible direct contact with contaminated surface soils, several inches of gravel were placed over the contaminated areas. In addition, potential ecological risks were identified for sensitive species exposure to site contaminants.

Response Actions

In December 1970, the Buffalo District of the U.S. Army Corps of Engineers inspected the site and notified the Companies that their disposal practices were in violation of the Rivers and Harbors Act of 1899 (RHA). As a result, any further landfilling at the site by the Companies stopped. In 1972, the site was capped, a fence was erected on three sides, and a bulkhead along the Niagara River was installed.

On December 20, 1979, a complaint pursuant to the Resource Conservation and Recovery Act (RCRA), the Clean Water Act (CWA), and the RHA was filed by the United States of America, on behalf of the Administrator of the EPA, against the Companies seeking injunctive relief to remediate imminent and substantial endangerment to the public health and welfare, and civil penalties. On November 18, 1980, a complaint pursuant to the New York State Conservation Law and the state's common law of public nuisance was filed by New York State (NYS) against the Companies in the U.S. District Court for the Western District of New York, seeking injunctive relief and civil penalties. The two complaints were consolidated. The site was added to the National Priorities List (NPL) in September 1983. In 1984, the Companies prepared a work plan for conducting the Remedial Investigation and Feasibility Study (RI/FS) at the site and after receiving EPA approval, the Companies commenced to investigate landfill residues, off-site fill, shallow groundwater, liquid waste, off-site soil, river sediments, and storm drains. The RI/FS was completed in 1990.

On September 26, 1990, EPA issued a Record of Decision (ROD) identifying the selected remedy for the site. The remedial objective of the selected remedy is to contain the source area and to prevent further migration of the contaminants to the extent possible.

The major components of the selected remedy include the following:

Landfill Residuals

- A synthetic-lined cap, constructed in accordance with federal and state standards, will be installed over the landfill and perimeter soil.
- All "off-site" soils above cleanup thresholds will be consolidated beneath the cap.
- A slurry wall, surrounding the site's perimeter, will be constructed and keyed into the underlying clay/till geologic formation. The precise location of the slurry wall will be established through the use of geotechnical boring which will determine the extent of the non-aqueous phase liquid (NAPL) plume. The NAPL plume is to be contained by the slurry wall.
- Groundwater will be recovered using an interception drain installed at the seasonal low water table in the fill materials. Recovered groundwater will be treated, however, the primary function of groundwater recovery is to create and maintain an inward gradient across the slurry wall.
- NAPL beneath the site will be recovered using dedicated extraction wells and incinerated at an off-site facility.

Niagara River Sediments

- The two areas of river sediments which contain elevated concentrations of contaminants ("hot spots") will be dredged, and these highly contaminated sediments will be incinerated at an off-site facility.
- The remaining sediments will be dredged out to the "clean line" with respect to site-related contamination.
- These remaining sediments, after dewatering, will then be consolidated on the landfill.
- Any NAPL found within the remaining sediments will be extracted and incinerated at an off-site facility.
- The primary focus of this remediation plan is to contain the NAPL plume with the slurry wall. In the event the slurry wall's initial positioning places it across the "hot spot" area(s), practicality may dictate that the wall be extended outward to enclose these "hot spots." In such case, these highly contaminated sediments, rather than being dredged and incinerated, would be left in place, that is, contained by the slurry wall, covered with fill, and finally covered with the cap. The remaining sediments beyond the slurry wall would still be dredged and consolidated beneath the cap.

Storm Sewer

- The existing storm sewer will be cleaned, and a high-density polyethylene plastic slip liner will be installed within the sewer. The annular space between the original pipe and the slip liner will then be pressure-grouted.
- Any NAPL found in the soils and/or sediments taken from the existing sewer will be extracted and incinerated at an off-site facility.

Monitoring & Institutional/Engineering Controls

- Post-remedial monitoring shall be performed to determine the effectiveness of the remedial alternatives which have been selected.
- A six-foot high chain-link fence will be installed around the perimeter of the cap in order to restrict access to the site.
- Institutional Controls (ICs) in the form of deed and groundwater use restrictions, on future uses of the landfill, will be established.

No Remedial Action Objectives (RAOs) were explicitly identified in the ROD.

EPA, pursuant to Section 106(a) of CERCLA, issued a Unilateral Administrative Order (UAO) to the Companies on September 30, 1991 to conduct the Remedial Design/Remedial Action at the site. Remedial design activities pursuant to the UAO began in October 1991. The Intermediate Engineering Report (IER), the equivalent of the Remedial Design Report, was approved by the EPA in 1993.

On September 30, 1994, EPA issued an Explanation of Significant Differences (ESD) to document a change in the remedial action for the then-existing storm sewer. The ESD documented the requirement to construct a new storm sewer that would be re-routed around the eastern perimeter of the landfill, and the then-existing storm sewer would be plugged and abandoned.

On June 9, 1995, EPA issued a ROD Amendment to document a change in the treatment of excavated sediments from the river. The remedial action, as identified in the 1990 ROD required dredging the river sediments to the “clean line” with respect to site-related contamination. As a result of the ROD Amendment, these sediments, after dewatering, would not be incinerated, but instead would be consolidated under the landfill cap. Any NAPL found within these sediments would be extracted and incinerated at an off-site facility, consistent with the 1990 ROD. The ROD Amendment also called for a realignment of the slurry wall so as to avoid the destruction of three acres of irreplaceable wetlands and aquatic habitat.

Status of Implementation

Landfill Residual Remediation

In April 1996, the remedial action began at the site. Construction activities including excavation, consolidation, and isolation of perimeter and off-site soils under the landfill cap were completed in August 1996.

Construction of the circumferential slurry wall was completed in May 1997. As noted above, a straight-line slurry wall alignment, outlined in the IER, would have destroyed approximately three acres of wetlands and aquatic habitat in the embayment area. Therefore, a modified alignment was constructed to preserve wetland and aquatic habitat and the shoreline was entirely dredged. The slurry wall was keyed into the underlying clay/till formation to hydraulically contain the aqueous phase liquid (APL)/NAPL plume within the site.

An interception drain was installed within the landfill at the seasonal low water table to recover leachate and create inward gradients across the slurry wall. Four individual APL wet wells are set at target elevations (561.9 feet AMSL) and shut down when elevations in the wells reach the target level. In March 1999, a force main system was installed to pump APL leachate from the landfill to the Love Canal Treatment Facility (LCTF). NAPL is recovered at the landfill and its presence is monitored by eight dedicated passive extraction wells (NR-01 to NR-08) which are monitored quarterly.

Construction of the hydraulic monitoring system included the installation of ten piezometers (PZ-01 through PZ-10) inside the slurry wall and ten overburden monitoring wells (PCM-01 through PCM-10) outside the slurry wall. Groundwater quality is monitored through sampling of the ten overburden monitoring wells and three bedrock monitoring wells (PCBM-01 through PCBM-03).

Installation of the landfill capping system began in November 1997. The capping system consists of a combination of geosynthetic and natural soil materials to minimize infiltration of precipitation and to isolate the landfill contents.

Access to the site is restricted by a six-foot high chain link fence that encircles the site along the property line and along the bulkhead. Additionally, ICs in the form of deed restrictions were implemented to ensure that future land use at the site is limited so as to preclude certain types of access to the landfill, prevent any construction or other activity that could interfere with the integrity of the cap or other engineering controls in place at the site, and to restrict groundwater use at the site.

Sediment Remediation

Beginning in July 1996, a cofferdam was built around the portion of the embayment which contained contaminated sediments. After the embayment area was dewatered, contaminated sediments above the site-specific action levels were excavated to a maximum depth of two feet and placed on top of the landfill prior to finalization of the cap installation. Clean fill was backfilled into the excavated embayment. This work was completed in November 1996.

Storm Sewer Remedy

Abandonment and relocation of the 42-inch 100th Street storm sewer that traversed the site was completed in September 1996.

Site Completion

A Preliminary Close-Out Report (PCOR), which summarizes remedial actions for landfill residuals, perimeter soils, shallow groundwater, NAPL, and river sediments, was signed by EPA on September 2, 1999. A settling Consent Decree was entered by the court on October 1, 1999. By means of a letter dated March 13, 2002, EPA accepted the Companies' Certification of Completion of the remedial action, and transferred the enforcement lead for oversight of the continuing operation and maintenance of the site to the New York State Department of Environmental Conservation (NYSDEC). The site was deleted from the NPL on August 5, 2004.

Institutional Controls

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Landfill	Yes	Yes	Sitewide	Maintain integrity of landfill cap and any implemented engineering controls.	Deed restriction, Jan 25, 2000.
Groundwater	Yes	Yes	Sitewide	Restrict groundwater use, other than that necessary for remedy functions.	Deed restriction, Jan 25, 2000.

Systems Operations/Operation & Maintenance

The Operations and Maintenance (O&M) Plan has been developed and is being implemented. Pursuant to the O&M Plan, as amended by the ESD, and as otherwise approved by the EPA, the necessary O&M activities currently include:

- Routine inspections of the capped area and maintenance of access restrictions.
- Regular mowing of landfill vegetation to prevent woody growth and preserve the cap.
- Quarterly groundwater level measurements.
- Quarterly NAPL presence monitoring, APL collection and discharge.
- Annual groundwater quality monitoring.

All APL leachate collected from the individual wells at the site has been, and continues to be transferred to the nearby LCTF, where the leachate is treated and discharged. The LCTF is permitted to discharge to the Niagara Falls municipal sewerage system for final treatment at the Niagara Falls Publicly Owned Treatment Works. Wet wells are shut down when elevations in the wells reach the target level in order to maintain the inward differential (gradient) of one to two feet.

NAPL is recovered at the landfill and its presence is monitored by eight dedicated extraction wells on a quarterly basis. If more than three gallons of NAPL is present in a recovery well, NAPL is removed and stored on-site before being transferred to the Clean Harbors facility in Aragonite, Utah, for incineration.

In accordance with the O&M Plan, groundwater level measurements are monitored within the piezometers and monitoring wells quarterly. There are ten overburden monitoring wells outside the slurry wall and three bedrock monitoring wells positioned on the southern, northern, and eastern sides of the site. These bedrock wells are monitored in the same manner as the overburden wells for water level and water quality.

Areas near the site have historically experienced flooding in low-lying areas adjacent to the Niagara River. However, as expected due to the elevated height of the site behind the bulkhead, no flood events are known to have occurred at the site. Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

III. PROGRESS SINCE THE LAST REVIEW

Table 2: Protectiveness Determinations/Statements from the 2016 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Protective	The remedy at the Hooker (102nd Street) Landfill site currently protects human health and the environment as there is no human exposure to contaminated groundwater or landfill residuals, and engineered and institutional controls continue to be operated, monitored and maintained. However, in order for the remedy to be protective in the long-term, additional sampling to assess elevated levels of contaminants outside the slurry wall will be conducted to ensure long-term protectiveness.

Table 3: Status of Recommendations from the 2016 FYR

Issue	Recommendations	Current Status	Current Implementation Status Description*	Completion Date (if applicable)
Monitoring wells PCM-03, 04, and 05 continue to exceed NYSDEC Class GA Groundwater Criteria.	Sample surface water and sediment in the embayment area outside the slurry wall.	Completed	Surface water sampling results were non-detect for all sampling parameters. Sediment sampling results were below NYSDEC Class A Guidance Values for all sampling parameters.	8/16/2017
Monitoring well PZ-08 has been 'dry' for six consecutive quarters.	Monitoring well PZ-08 should be tested and possibly redeveloped or replaced.	Ongoing	Monitoring well PZ-08 has been dry for 22 consecutive quarters; however, contour maps of the landfill show that there is a north to south groundwater gradient towards the APL collection trench in the southern part of the landfill, indicating that groundwater flows away from the northern wall, and water quality data collected from wells located on the outside of the slurry wall along its northern section do not show contamination.	Click here to enter a date

Recommendation #1

Long-term groundwater quality monitoring indicates that residual contamination remains outside the slurry wall. In 2011, NYSDEC requested an investigation of the residual contamination outside the slurry wall. The involved agencies understood that residual material remained outside the slurry wall, however, it was expected that the contamination would decrease in time. Monitoring wells PCM-03, PCM-04, and PCM-05 continue to exceed NYSDEC Class GA Groundwater Criteria.

In 2013, Glenn Springs Holdings, Inc (GSHI), representing OCC, stated that GSHI acknowledges that the concentrations of contaminants outside the slurry wall had remained relatively stable since the implementation of the remedy. In order to evaluate these chemical concentrations, GSHI reviewed the conditions at the site before and after implementation of the remedy and concluded the following:

- The elevated concentrations observed historically and currently in these wells are likely the result of a combination of impacted groundwater remaining outside of the slurry wall following its installation and potentially impacted sediments remaining below the two-foot removal depth.
- There is no gradient through the alluvium between the slurry wall and shoreline for groundwater to discharge to the river.
- The current hydraulic data indicate that the groundwater in the alluvium between the slurry wall and shoreline is essentially stagnant.
- Conditions at PCM-03, PCM-04, and PCM-05 are anaerobic, which are conducive to reductive dechlorination.
- An assessment of the potential for natural attenuation indicates that if natural attenuation is occurring through reductive dechlorination, a decrease in chlorobenzene concentration will not be observed until all the residual chlorobenzenes have desorbed from the impacted sediments.

GSHI further stated that a combination of the conclusions listed above is reason why the elevated concentrations outside the slurry wall have not decreased.

In April 2016, EPA requested that OCC/GSHI conduct sampling of offshore sediment and surface water to address the FYR recommendations. OCC/GSHI agreed to conduct sampling of sediment and surface water in three locations associated with the locations of monitoring wells PCM-03, PCM-04, and PCM-05, respectively. The surface water and sediment samples were collected approximately 75 feet offshore perpendicular to monitoring wells PCM-03 and PCM-04, and slightly west of PCM-05 in order to avoid a sewer outfall that runs perpendicular to PCM-05 (Figure 3).

In August 2017, GSHI conducted offshore surface water and sediment sampling in accordance with the methods indicated in the approved work plan. Samples were analyzed for site-specific parameters associated with the residual contamination observed in wells PCM-03, PCM-04, and PCM-05. There were no detections of analyzed parameters in the surface water samples. The detected concentrations of parameters in the sediment samples were all below the most stringent Guidance Values (Class A) as set forth by the NYSDEC. The sampling results indicate that the residual contamination in wells PCM-03, PCM-04, and PCM-05 has not impacted surface water or sediment offshore of the site. At this time, no further action is required to assess potential impacts to offshore surface water and sediments.

Recommendation #2

Well PZ-08 was dry during all of the quarterly water level monitoring events from 2016-2019. In 2012, OCC conducted hydraulic response testing of all overburden monitoring wells and piezometers. In addition, sounded depths were measured to determine whether infilling of the well screens had occurred. The results of the well sounding indicated that all overburden monitoring wells were open to within one foot of their installed depths, therefore, infilling had not occurred. The results of the hydraulic response testing indicated that all of the overburden monitoring wells and piezometers are in hydraulic communication with the materials in which they are screened. Based on the results of the hydraulic response testing, it was proposed that PZ-06, PCM-06, PC-09 and PCM-09 be reinstalled to a depth sufficient to intersect the water table. During the installation of the soil borings, the overburden was found to be dry. It was concluded that the reinstallation of deeper wells below the confining layer would not be useful in monitoring site conditions, therefore, replacement wells were not installed. Only well PZ-09R was installed, as PZ-09 had been abandoned prior to the installation of the PZ-09R soil boring. However, the well was found to be dry and, therefore, development did not occur.

OCC has been unable to collect groundwater elevations from well PZ-08 since 2016 due to dry conditions. Well PCM-08, located across the slurry wall adjacent to well PZ-08, has exhibited consistent elevation data since 2016. Adjacent to well pair PZ-08/PCM-08, well pair PZ-09R/PCM-09 has consistently demonstrated an inward hydraulic gradient across the slurry wall. Additionally, since the redevelopment of well PZ-07 in 2018, well pair PZ-07/PCM-07R has also demonstrated an inward hydraulic gradient across the slurry wall. Groundwater quality data from 2016 to 2019 indicate that the slurry wall continues to function as designed, preventing off-site migration of site-specific contaminants. Therefore, it is recommended that well PZ-08 continue to be monitored as set forth in the Hydraulic Monitoring program, and that the PRPs develop a process to evaluate the inward hydraulic control in the areas of the landfill where piezometers are no longer in contact with the water table.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On September 22, 2020, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands, including the Hooker (102nd Street) Landfill site. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, a notice of the commencement of the FYR was sent to local public officials, and requesting that the notice be made available via the City of Niagara Falls website on 12/1/2020. The purpose of the notice was to inform the community that EPA would be conducting a FYR to ensure that the remedy implemented at the site remains protective of public health and the environment. In addition, the notice provided contact information, including addresses and telephone numbers, for questions related to the FYR process or the site.

Once the FYR is completed, the results will be made available to the local elected officials, on EPA's Hooker (102nd Street) Landfill site webpage (https://www.epa.gov/superfund/hooker-102nd-street), and at the EPA Region 2 Superfund Records Center, 290 Broadway, 18th Floor, New York, New York, 10007.

Data Review

The documents, data, and information which were reviewed in completing this FYR are summarized in Appendix A.

APL Collection and Discharge

Since the completion of the force main system and initiation of the leachate pumping operations, the system has shown integrity in that the four wet wells have been recharging properly, the leachate level within the landfill has decreased and been maintained at a reduced level. During the present operations, enough leachate has been and will be removed from the landfill so as to maintain the inward differential (gradient) of one to two feet. The force main system is pumping sufficient APL leachate from the landfill to the treatment facility as to consistently maintain an inward gradient across the slurry wall at almost all well pairs.

From 2016-2019, a total of 593,892 gallons of APL were removed and conveyed to the LCTF, a yearly average of 148,473 gallons. This quantity of APL represents a decreased yearly average from 184,970 gallons reported for 2016 to 124,190 gallons reported for 2019. A total of approximately 9.8 million gallons of APL have been recovered from the site since pumping was initiated in March 1999.

NAPL Presence Monitoring

NAPL is recovered at the landfill and its presence is monitored at eight dedicated NAPL recovery (NR) wells on a quarterly basis. Performance data show that the NAPL recovery is functioning properly. For the period between 2016 and 2019, the total quantity of NAPL removed was 2,477.2 gallons. This quantity is somewhat more than half the quantity of NAPL recovered during the previous five-year period (4,487 gallons); the decrease likely reflects decreasing availability of recoverable and mobile NAPL from the landfill subsurface. The majority of NAPL recovered was extracted from NR-02. NAPL is transported to a Clean Harbors facility in Aragonite, Utah for incineration.

Landfill Cap/Consolidated Soils & Sediment

Based on site inspections, the landfill cap is in good repair. There appears to be no significant subsidence or breach on the cover. The perimeter fence is intact and restricts access as intended.

Hydraulic Monitoring

According to performance data from 2016-2019, quarterly water level monitoring at the ten well pairs along the landfill perimeter indicate that hydraulic capture has been maintained in the southern portion of the landfill, but cannot be consistently measured along the north/northeastern section of the landfill.

Well PZ-06, located inside the slurry wall, has been dry during every quarterly water level monitoring event from 2016-2019. Therefore, it could not be confirmed whether an inward hydraulic gradient was maintained across the slurry wall in the northeast corner of the landfill.

Water level measurements for the well pair PCM-07R and PZ-07 have shown that inward gradients were not consistently maintained for six of the 16 quarters between 2016 and 2019. This may be related to the first and fourth quarter measurements (usually in March and December) when water levels increase compared to levels in the summer. However, after PZ-07 was redeveloped in June 2018, the groundwater elevations in this well were lower than those in PCM-07R during all four quarterly monitoring events in 2019, indicating an inward hydraulic gradient.

Well PZ-08, located inside the slurry wall, has been dry during every quarterly water level monitoring event since September 2012. Therefore, it could not be confirmed whether an inward hydraulic gradient was maintained across the slurry wall in the northern portion of the landfill. However, adjacent well pairs PZ-07/PCM-07R and PZ-09R/PCM-09 demonstrated consistent inward hydraulic gradients across the slurry wall from 2018-2019.

Since well PZ-09 had historically been dry during quarterly monitoring events, it was replaced with PZ-09R in 2012. Water level monitoring confirmed an inward hydraulic gradient at this location from 2016 to 2019.

Wells PZ-06 and PZ-08 were dry during every quarterly water level monitoring event from 2016 to 2019. Therefore, it could not be determined if inward hydraulic gradients were maintained across the northern portion of the slurry wall where these wells are located. Nevertheless, piezometric contour maps of the landfill show that there is a north to south groundwater gradient towards the APL collection trench in the southern part of the landfill, indicating that groundwater flows away from the northern wall. Water quality data collected from wells PCM-06, PCM-07, PCM-08, and PCM-09 located on the outside of the slurry wall along its northern section do not show contamination, except for one exceedance of arsenic (50 µg/L) in PCM-09 during the October 2018 sampling event. Given the low permeability of the slurry wall and the current groundwater flow direction from north to south, the potential for contaminant migration across the slurry wall is negligible. However, in order to confirm that the remedial goal of hydraulic containment is achieved, the PRPs should develop a process to evaluate the inward hydraulic control in the areas of the landfill where piezometers are no longer in contact with the water table.

Groundwater Quality Monitoring

The groundwater quality monitoring program calls for annual collection of groundwater samples from ten monitoring wells screened in the overburden (PCM-01 to PCM-10) and three monitoring wells screened in the bedrock (PCMB-01, PCMB-02, and PCMB-03). These wells are sampled for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total metals (arsenic and mercury), and pesticides.

Annual groundwater quality samples from wells screened in the overburden and wells screened in the bedrock between 2016 and 2019 indicate that there were no exceedances above their respective criteria at most perimeter wells. However, VOCs, SVOCs, and pesticides continue to exceed regulatory standards and cleanup goals in wells PCM-03, PCM-04, and PCM-05 (screened in the overburden) from 2016-2019. In well PCM-03, concentrations of VOCs generally fluctuated with maximum concentrations of 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2-chlorotoluene and benzene detected at 59 µg/L, 390 µg/L, 13 µg/L, and 44 µg/L, respectively. Chlorobenzene continues to be detected above the cleanup goal of 5 µg/L, with a maximum detection of 3,800 µg/L in 2018 (Figures 4 and 5). Detections of SVOCs in this well also exceeded the cleanup goals of 1 µg/L during this same period. 2,4-dichlorophenol, 2,5-dichlorophenol, 2-chlorophenol, and 4-chlorophenol were detected at maximum concentrations of 24 µg/L, 5.2 µg/L, 24 µg/L, and 53 µg/L, respectively (Figure 6). There were detections of pesticides, such as beta-benzene hexachloride (BHC) (up to 0.092 µg/L) and delta-BHC (up to 1.1 µg/L). The NYSDEC Water Quality Regulation (WQR) for beta- and delta-BHC is 0.04 µg/L for both constituents, however there were no cleanup goals set forth in the ROD for beta- and delta-BHC.

Similarly, concentrations of VOCs in well PCM-04 generally fluctuated with maximum concentrations of 1,2-dichlorobenzene, 1,4-dichlorobenzene, and benzene detected at 21 µg/L, 230 µg/L, and 27 µg/L, respectively. Chlorobenzene was detected at 8000 µg/L, which is the highest concentration observed during this FYR period (Figures 7 and 8). Detections of SVOCs in this well also exceeded ARARs. 2,4-dichlorophenol, 2-chlorophenol, and 4-chlorophenol were detected at maximum concentrations of 1.6 µg/L, 24 µg/L, and 47 µg/L, respectively. Pesticides were not identified as ARARs in the ROD. In well PCM-05, chlorobenzene concentrations exhibited a decreasing trend with the highest concentration detected at 110 µg/L during 2016 and 2017 (Figure 9). Other VOCs, SVOCs, and pesticides did not exceed cleanup goals in PCM-05. In well PCM-09, there was one exceedance of arsenic (50 µg/L) in 2018, double the cleanup goal of 25 µg/L.

The chemical constituents observed, their concentration ranges, and the locations where observed are consistent with the site's historical water-quality data. It should be noted that the overburden wells (screened less than 30 feet deep) are screened along the south/southeast side of the landfill beyond the slurry wall, near the shoreline. Since inward gradients along the southern portion of the slurry wall have been consistently maintained, it does not appear that the contamination is due to groundwater seeping from the landfill. Rather, the data indicate that the likely source of contaminants originate from residual contamination in the soils below the two-foot removal depth outside the slurry wall. Further, residual contamination in subsurface soil may persist in the soil matrix where wells are screened, affecting the saturated zone between the slurry wall and embayment. According to the piezometric contour maps and the inward gradients along the southern portion of the slurry wall, it is unlikely that any dissolved phase contaminants migrate towards the river. While the inward gradients across the slurry wall should limit the migration of contaminated groundwater, it is possible that contaminated interstitial pore water may migrate into the surface water in the embayment area and affect ambient surface water quality. However, surface water and sediment data indicate that the residual contamination in wells PCM-03, PCM-04, and PCM-05 has not impacted these media offshore of the site. *C*ontaminant trends will continue to be evaluated to ensure that attenuation is occuring over time.

Offshore Surface Water/Sediments

In August 2017, samples were collected from off-shore surface water and sediment approximately 75 feet from the embayment and perpendicular to wells PCM-03, PCM-04, and PCM-05. Samples were analyzed for site-specific parameters to determine if contaminants from the above wells were migrating to the river. There were no detections of VOCs, SVOCs, pesticides, or metals in the surface water samples. Sediment samples from the river indicate very low concentrations of metals such as arsenic (up to 1.8 milligrams per kilogram (mg/kg)) at location PCM-03 and mercury (up to 0.164 mg/kg) at location PCM-05, both below the most stringent NYSDEC sediment contamination guidance values of 10 mg/kg and 0.2 mg/kg, respectively (Class A).

Emerging Contaminants: PFAS & 1,4-Dioxane

As part of a new state-led sampling program, four wells screened in the overburden (PCM-03, PZ-03R, PCM-05, and PZ-05) and two wells screened in the bedrock (PCMB-01 and PCMB-02) were sampled for previously uncharacterized contaminants in December 2019, including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. These samples were collected at wells located along the southern portion of the slurry wall and were analyzed per the *Scope of Work Emerging Contaminants (EC) Sampling at OCC Remediation Sites* document.

The EPA Health Advisory (HA) level is 70 nanograms per liter (ng/L) for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), individually and combined. The NYS Maximum Contaminant Level (MCL) for PFOA and PFOS is 10 ng/L. PFOA and PFOS were detected at maximum concentrations of 6.3 ng/L and 5.4 ng/L in well PCM-05, respectively. There were no exceedances of the EPA HA or the NYS MCL for PFOA or PFOS.

There were exceedances of the EPA screening level for 1,4-dioxane (0.35 µg/L) and the NYS MCL (1 µg/L) for drinking water in four of six wells (PZ-03R, PCM-03, PZ-05, and PCM-05). The highest concentrations of 1,4-dioxane were detected in wells PZ-03R (91 µg/L) and PCM-03 (80 µg/L), which are located in close proximity to one another in the south-western section of the slurry wall. On the south-eastern section of the slurry wall, 1,4-dioxane was detected at much lower concentrations in wells PZ-05 (2.2 µg/L), PCM-05 (1.8 µg/L) and PCBM-02 (non-detect). Due to the detected concentrations of 1,4-dioxane, EPA will continue to work with the NYSDEC to determine future sampling needs, including sampling the effluent from the LTCF to determine the concentration of 1,4-dioxane discharged to the POTW.

Site Inspection

Due to health and safety considerations from the COVID-19 pandemic, a site inspection was not completed by the review team during this FYR period. In lieu of an EPA site inspection, representatives from GSHI visited the site and submitted current photographs of the site depicting the landfill cap, monitoring wells, site fencing. No issues impacting protectiveness were observed. The photographs are included in Appendix C of this report. A formal site inspection by the review team will be conducted at a later date.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

The primary remedial objective of the 1990 ROD was hydraulic containment of APL/NAPL within the landfill. The 1990 ROD selected remedy consisted of the following components:

- Installation of a slurry wall around the landfill perimeter;
- Recovery and treatment of APL leachate;
- Separate recovery of NAPL and off-site incineration;
- Consolidation of contaminated soils beneath an impermeable landfill cap; and
- Installation of a perimeter fence.

The 1995 ROD Amendment eliminated the requirement to incinerate contaminated sediments excavated from the embayment area and instead required they be consolidated beneath the landfill cap. The ROD Amendment also called for long-term remedial monitoring and institutional controls to restrict land and groundwater use from the site. Based on performance data for the past five years, the remedy is functioning according to design.

APL Collection and Discharge

In 1997, a slurry wall was installed around the perimeter of the landfill to hydraulically contain the APL/NAPL within the landfill. An interception drain was also installed at the seasonal low water table to recover landfill leachate, and to create inward gradients across the slurry wall. Since APL pumping and collection began in 1996, inward gradients have generally been maintained, ensuring the site-specific contaminants are contained. From 2016 to 2019, a yearly average of 148,473 gallons were removed and conveyed to the LCTF. Based on performance data for this time period, the groundwater APL collection system appears to be functioning according to design.

NAPL Recovery

NAPL is recovered at the landfill and its presence is monitored at eight dedicated NR wells on a quarterly basis. Performance data show that the NAPL recovery system is functioning properly. From 2016 to 2019, a yearly average of 619.3 gallons of NAPL were removed, most of which was extracted from well NR-02.

Landfill Cap/Consolidated Soils and Sediment

In 1997, the consolidation of excavated sediment under the landfill cap and installation of the cap were completed. Constructed of a geosynthetic layer and natural soil material, the landfill cap appears to contain the APL/NAPL plume and eliminate exposure pathways for the site-specific contaminants to reach the surface.

Hydraulic Monitoring

For the past five years, quarterly water level monitoring at ten well pairs along the landfill perimeter indicate that hydraulic capture has been maintained in the southern portion of the landfill, but has not been consistently maintained in the north/northeastern section of the landfill. Water level measurements for the well pair PCM-07R and PZ-07 have shown that inward hydraulic gradients were not consistently maintained for six of the 16 quarters between 2016 and 2019. Additionally, wells PZ-06 and PZ-08 were dry during every water level monitoring event since at least 2016. Therefore, it cannot be concluded that inward hydraulic gradients were maintained across the northern portion of the slurry wall where these well pairs are located. However, piezometric contour maps of the landfill show that there is a north to south groundwater gradient toward the APL collection trench in the southern part of the landfill indicating that groundwater flows away from the northern wall. To ensure that the APL/NAPL plume continues to be contained by inward groundwater gradients around the slurry wall, it is recommended that a process is developed to evaluate the inward hydraulic control in areas of the landfill where piezometers are no longer in contact with the water table.

Groundwater Quality Monitoring

From 2016-2019, annual groundwater quality samples from wells screened in the overburden and wells screened in the bedrock indicate that there were no exceedances above their respective criteria at most perimeter wells. However, concentrations of VOCs, SVOCs, and pesticides in wells PCM-03, PCM-04, and PCM-05 (screened in the overburden) remain consistent with historic trends and continue to exceed criteria. These wells are screened along the south/southeast side of the landfill, on the outside of the slurry wall near the shoreline, which had originally been targeted for removal prior to 1995 ROD amendment. Since inward hydraulic gradients along the southern section of the landfill have been consistently maintained, it does not appear that this contamination is due to contaminated water seeping from the landfill, but rather, is due to residual contamination from soils that were on the outside of the slurry wall. Monitoring wells PCM-03, PCM-04 and PCM-05 are all located outside of the slurry wall, along the steep embankment of the Niagara River. Due to the consistent inward gradient observed in well pairs PZ-03/PCM-03, PZ-04/PCM-04 and PZ-05/PCM-05, there is no evidence to suggest that any dissolved phase contamination is moving towards the river. Additionally, surface water and sediment data indicate that the residual contamination in wells PCM-03, PCM-04, and PCM-05 has not impacted these media offshore of the site. *C*ontaminant trends will continue to be evaluated to ensure that attenuation is occuring over time.

Off-Shore Surface Water/Sediments

Sampling of off-shore surface water in 2017 revealed no detections of site-specific parameters. Sampling of off-shore sediments indicated very low concentrations of site-specific parameters such as arsenic (up to 1.8 mg/kg) and mercury (up to 0.164 mg/kg), but not exceeding the NYSDEC sediment contamination guideline values of 10 mg/kg and 0.2 mg/kg, respectively. The sampling results indicate that residual contamination from wells PCM-03, PCM-04, and PCM-05 is not impacting human health or the environment through groundwater discharge to the river.

Institutional/Engineering Controls

A six-foot-tall chain-link fence was installed around the perimeter of the cap to restrict unauthorized access to the site. Groundwater use restrictions were implemented at the site to preclude the extraction of groundwater other than as required for the implementation of O&M activities for the remedy. Further, deed restrictions prevent any construction or other activity that could interfere with the integrity of the landfill cap or other engineering controls in place at the site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The majority of the exposure pathways and the receptor populations identified in the 1990 Baseline Human Health Risk Assessment are still valid. Although some exposure assumptions have changed and several exposure pathways were not evaluated, these changes are not expected to affect the protectiveness of the remedy.

The toxicity values for several of the Contaminants of Potential Concern (COPCs) have changed since the human health risk assessment was completed. In order to account for changes in toxicity values since the HHRA, the maximum detected concentrations of COPCs detected in the on-site monitoring wells during the 2016-2019 sampling period were compared to their respective residential groundwater Remedial Screening Levels and MCLs (National Primary Drinking Water Standards) and NYSDEC Water Quality Regulations (WQR). Several site-related constituents have consistently been detected in the wells downgradient of the site (PCM-03, PCM-04 and PCM-05) above their respective criteria. Since an inward gradient has consistently been maintained in the southern portion of the landfill, the concentrations of the constituents detected in the downgradient wells does not suggest that the site-related contamination is breaching the slurry wall, but rather residual contamination exists outside the slurry wall. Exposure to the groundwater in this area is prevented by the ICs in place at the site.

Surface water and sediment sampling was conducted in 2017 to evaluate if the contamination detected in the downgradient wells is impacting the Niagara River area. Site-related constituents were not detected in the surface water samples. Several constituents were detected in the sediment samples (arsenic, mercury and gamma-BHC). The concentrations were compared to their respective NYSDEC Class A guidance values for sediment (NYSDEC 2014). The concentrations of constituents in sediment were all below the Class A guidance values.

Soil vapor intrusion was not previously evaluated during the RI as a potential future exposure pathway. This exposure pathway was qualitatively addressed in the 2011 FYR. Several site-related constituents exceed the EPA vapor intrusion screening levels (VISLs). This does not indicate that a vapor intrusion problem would occur if a building were to be erected over the site, merely that further investigation would be necessary, which includes site-specific considerations such as the type of building, the location of the building respective to the maximum detected concentration, and the subsurface characteristics of the site. Currently, there are no buildings on the site; therefore, the exposure pathway is incomplete at this time.

As part of the remedy, the soil and the sediment in the outlying embayment areas were excavated and consolidated under the landfill cap. The maximum depth of excavation in the embayment area was two feet. The cleanup goals for some contaminants identified in the ROD are below their respective NYSDEC soil cleanup objectives (SCOs). Perimeter soils identified during the RI to contain TCDD above 1 μg/kg were excavated and backfilled as part of the remedy. Although the cleanup goal for dioxin has changed, the cleanup level of 1 µg/kg for this area is still protective because the excavated areas are covered with several inches of gravel and topsoil, thereby preventing exposure to the soils beneath the excavated area. The perimeter soils are kept intact by a vegetative cover, which is periodically inspected by the PRPs to confirm the integrity of the cover.

In 1997, EPA published the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997), followed by the more generic *Guidelines for Ecological Risk Assessment* (EPA 1998). Because the environmental endangerment assessment conducted for the ROD preceded formal EPA guidance for risk assessments, it used a two-phased approach based on available screening levels and methodologies to assess ecological risk. Aquatic organisms and fish-eating species were evaluated. Sediment Quality Criteria were developed based on ambient water quality criteria values. Chemical specific clean-up levels for sediment included benzene at 40 µg/kg, TCE at 111 µg/kg and PCBs at 42.4 µg/kg. These values may be compared to screening criteria found in *Screening and Assessment of Contaminated Sediment* (NYSDEC 2014) which indicates values for benzene <530 µg/kg, TCE <1800 µg/kg, and PCBs <100 µg/kg. It is noted in the guidance that, "If the concentration of a contaminant in sediment is below the sediment guidance value that defines this class, the contaminant can be considered to present little or no potential for risk to aquatic life." Therefore, the values selected in the ROD remain protective of ecological receptors. Further, the landfill cap eliminates the potential terrestrial pathway to ecological receptors. Surface water and sediment sampling was conducted in 2017 to evaluate if the contamination detected in the downgradient wells are impacting the Niagara River area. Site-related constituents were not detected in the surface water samples. Several constituents were detected in the sediment samples (arsenic, mercury and gamma-BHC). The concentrations were compared to their respective NYSDEC Class A guidance values for sediment (NYSDEC 2014). The concentrations of constituents in sediment were all below the Class A guidance values. Although risk assessment methodologies presented in EPA guidance have evolved since the ROD was completed, the changes and current concentrations are such that an ecological risk assessment using updated methodology would not be expected to lead to identification of issues with the protectiveness of the remedy. The 2017 surface water and sediment sampling confirmed that the remedy remains protective.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

There are no issues and recommendations identified in this FYR. However, the following suggestion would help with evaluation of remedy performance, but does not affect protectiveness:

- Wells PZ-06 and PZ-08 have been 'dry' consecutively for 16 and 22 quarters, respectively. The PRPs should develop a process to evaluate the inward hydraulic control in the areas of the landfill where piezometers are no longer in contact with the water table.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Planned Addendum Completion Date:* Click here to enter a date
Protectiveness Statement: The remedy at the Hooker (102nd Street) Landfill site is protective of human health and the environment.	

VIII. NEXT REVIEW

The next FYR report for the Hooker (102nd Street) Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

102nd Street Landfill Emerging Contaminants Sampling Summary, Groundwater & Environmental Services, Inc., 2020.

2016 Annual Periodic Review Report, 102nd Street Landfill Site, Niagara Falls, New York, Glenn Springs Holdings, Inc., 2016.

2017 Annual Periodic Review Report, 102nd Street Landfill Site, Niagara Falls, New York, Glenn Springs Holdings, Inc., 2017.

2018 Annual Periodic Review Report, 102nd Street Landfill Site, Niagara Falls, New York, Glenn Springs Holdings, Inc., 2018.

2019 Annual Periodic Review Report, 102nd Street Landfill Site, Niagara Falls, New York, Glenn Springs Holdings, Inc., 2019.

EPA Superfund Record of Decision: Hooker (102nd Street), USEPA, 1990.

EPA Superfund Record of Decision Amendment: Hooker (102nd Street), USEPA, 1995.

Fourth Five Year Review Report Hooker (102nd Street) Superfund Site, Niagara County, New York, USEPA, September 2016.

Remedial Investigation Final Report, 102nd Street Landfill Site, Niagara Falls, New York, Occidental Chemical Corporation, 1990.

Scope of Work, Emerging Contaminants (EC) Sampling at Occidental Chemical Corporation (OCC) Remediation Sites, 102nd Street Landfill, Niagara Falls, New York, NYSDEC, 2019.

Scope of Work – Surface Water and Sediment Sampling 102nd Street Landfill, Niagara Falls, New York, Glenn Springs Holdings, Inc., 2016.

Surface Water and Sediment Sampling, August 2017, 102nd Street Landfill, Niagara Falls, New York, Glenn Springs Holdings, Inc., November, 2017.

APPENDIX B – Tables & Figures

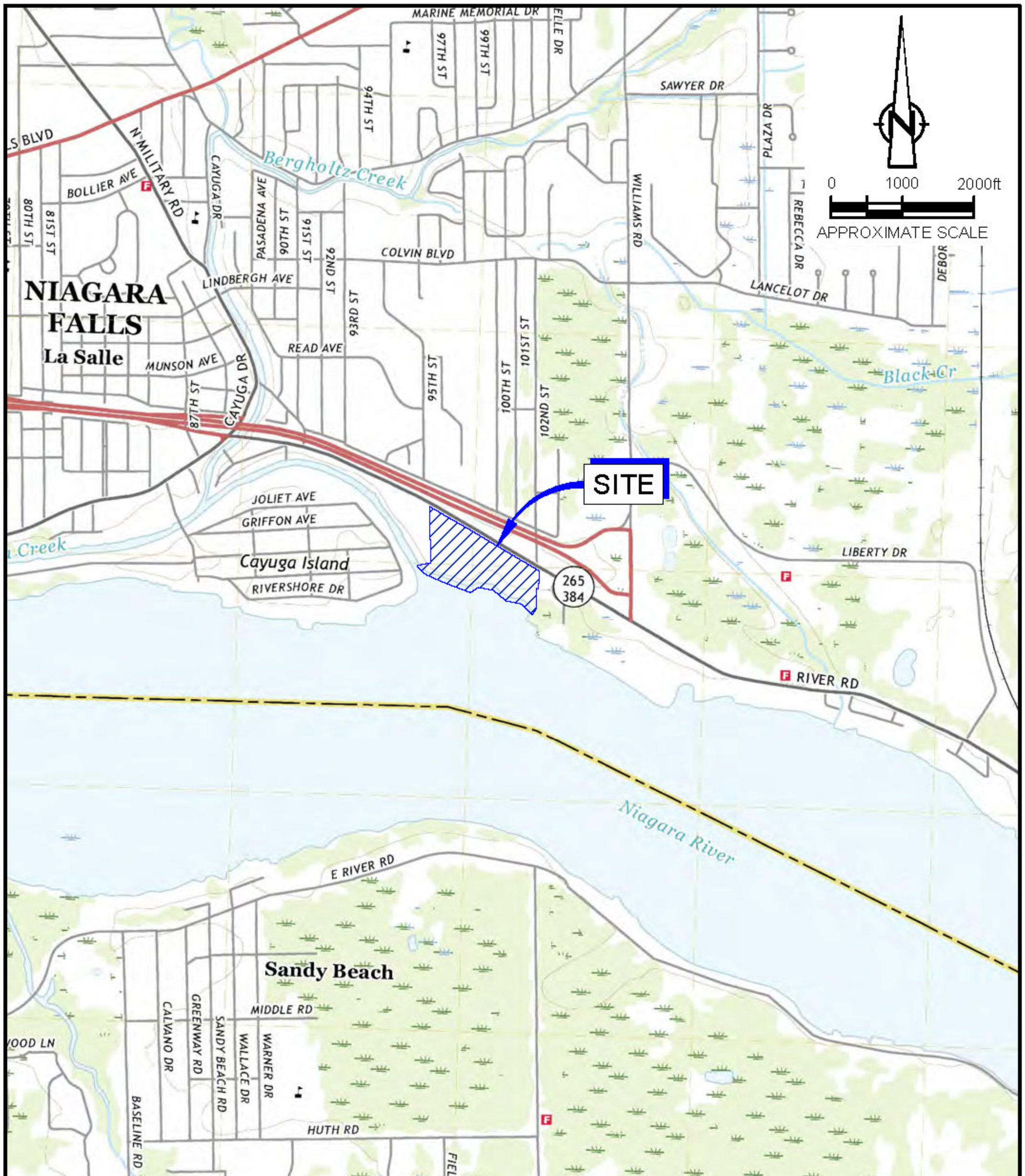
TABLES

Table 4: Chronology of Site Events

Event	Date(s)
RI Work Plan negotiations and pre-remedial investigations	1982 – 1984
Site listed on the National Priorities List	Sep 1983
RI Work Plan approved	Jun 1984
Site Operations Plan for RI approved	Dec 1984
Commencement of RI field work	1985
RI Final Report and FS Final Report approved	Jul 1990
ROD signed by EPA	Sep 1990
EPA issued Special Notice letters for the Remedial Design & Remedial Action	Sep 1991
UAO for Remedial Design and Remedial Action	Sep 1991
ESD issued	Sep 1993
ROD Amendment issued	Jun 1995
Commencement of Remedy Construction	Apr 1996
Remedy Construction completed	Mar 1999
First Five-Year Review report issued by EPA	Aug 2001
NYSDEC assumed oversight responsibilities of PRPs O&M activities	Mar 2002
Site deleted from the National Priorities List	Aug 2004
Second Five-Year Review issued by EPA	Sep 2006
Third Five-Year Review issued by EPA	Sep 2011
Fourth Five-Year Review issued by EPA	Sep 2016

FIGURES

Figure 1: Site Location



SOURCE:
- USGS QUADRANGLE MAP; TONAWANDA WEST, NY, 2019.

Figure 1

SITE LOCATION
2019 PERIODIC REVIEW REPORT
102ND STREET LANDFILL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

N:\CA\Waterloo\Legacy\CAD\drawings\01000s\01431\01431-REPORTS\01431-50-403(097)\01431-50-403(097)GN\01431-50-403(097)GN-WA001.DWG Plot Date: FEB 21, 2020

Figure 2: Google Earth Aerial View

Figure 3: Surface Water and Sediment Sampling Locations

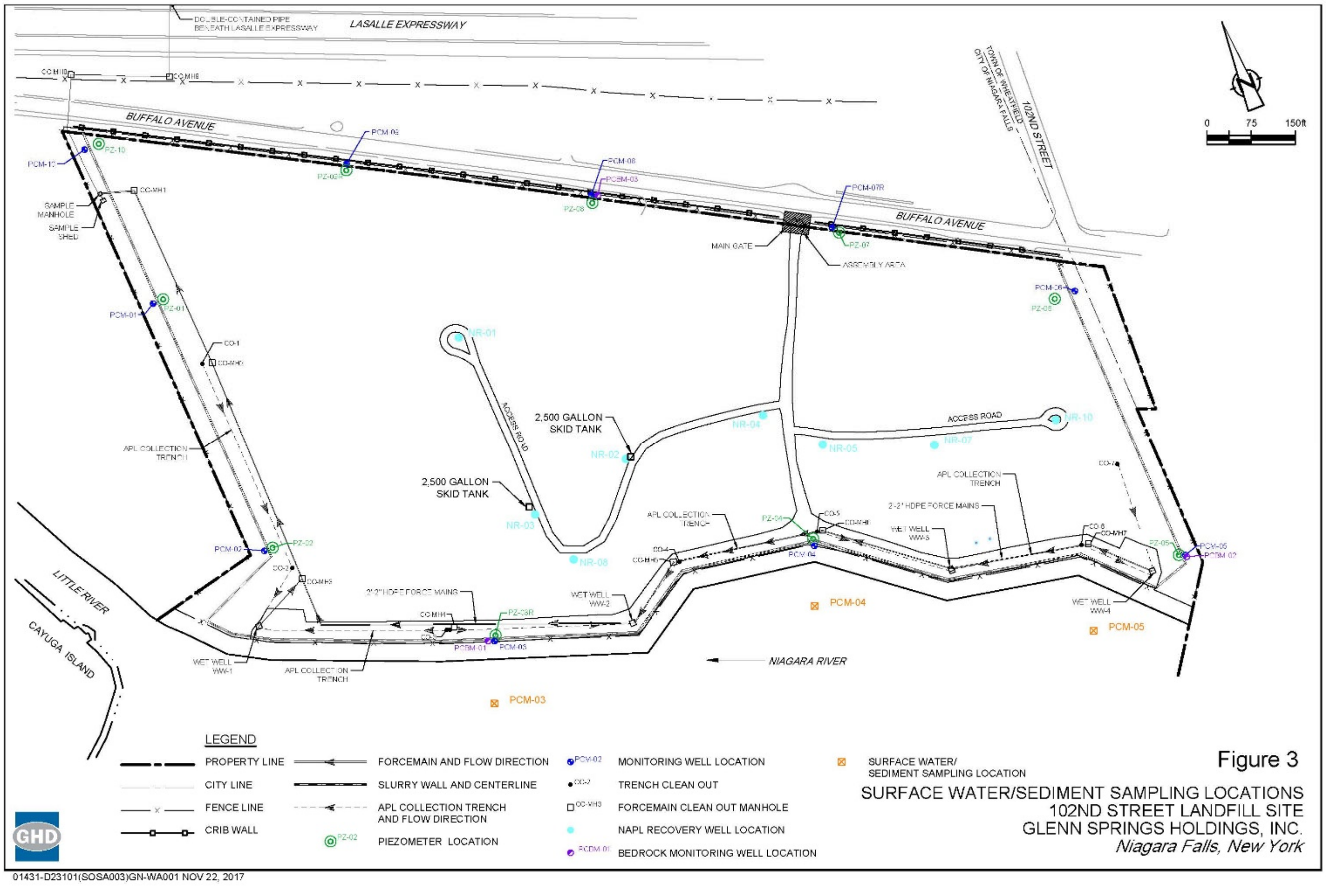
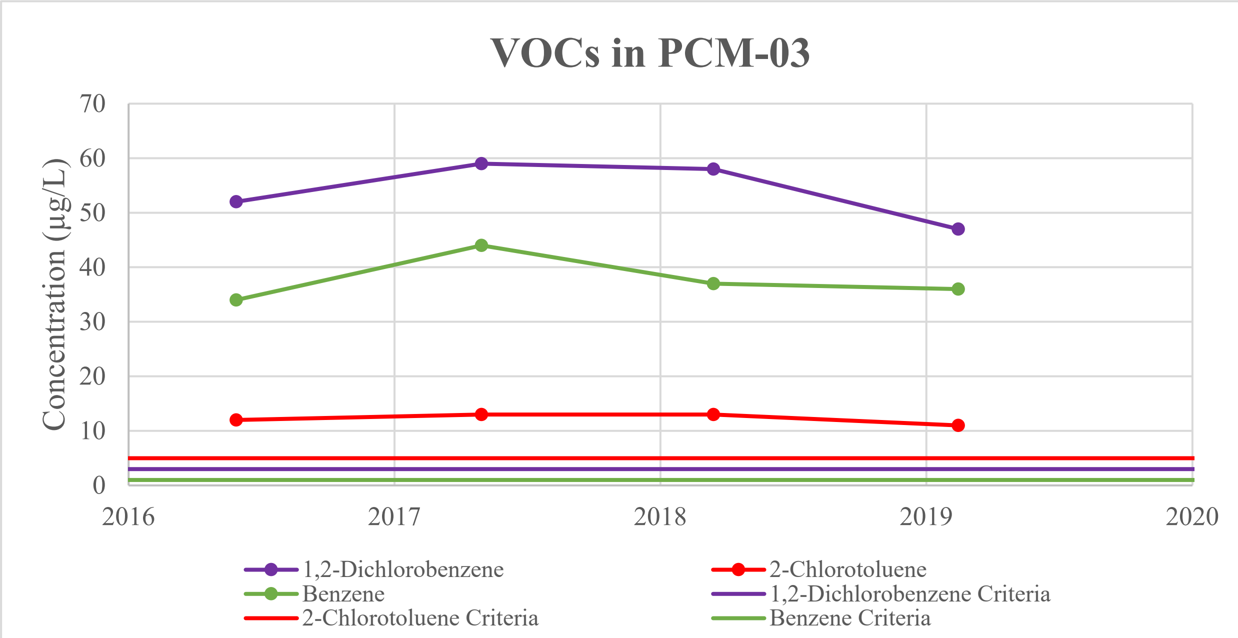
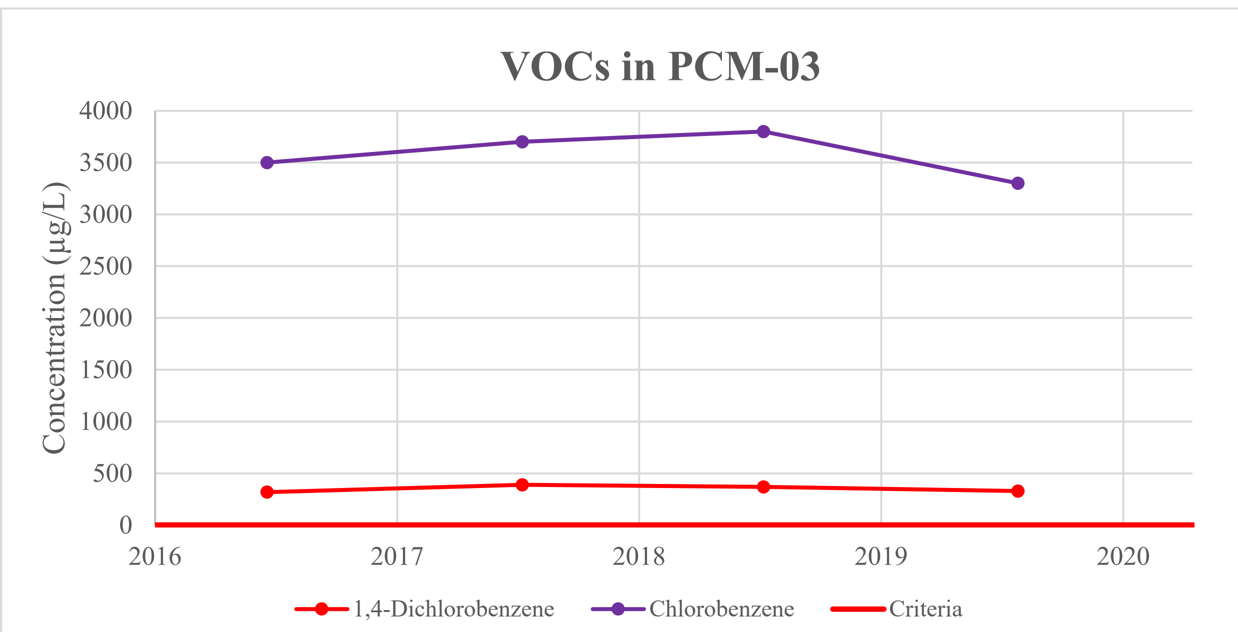


Figure 4: VOCs in PCM-03



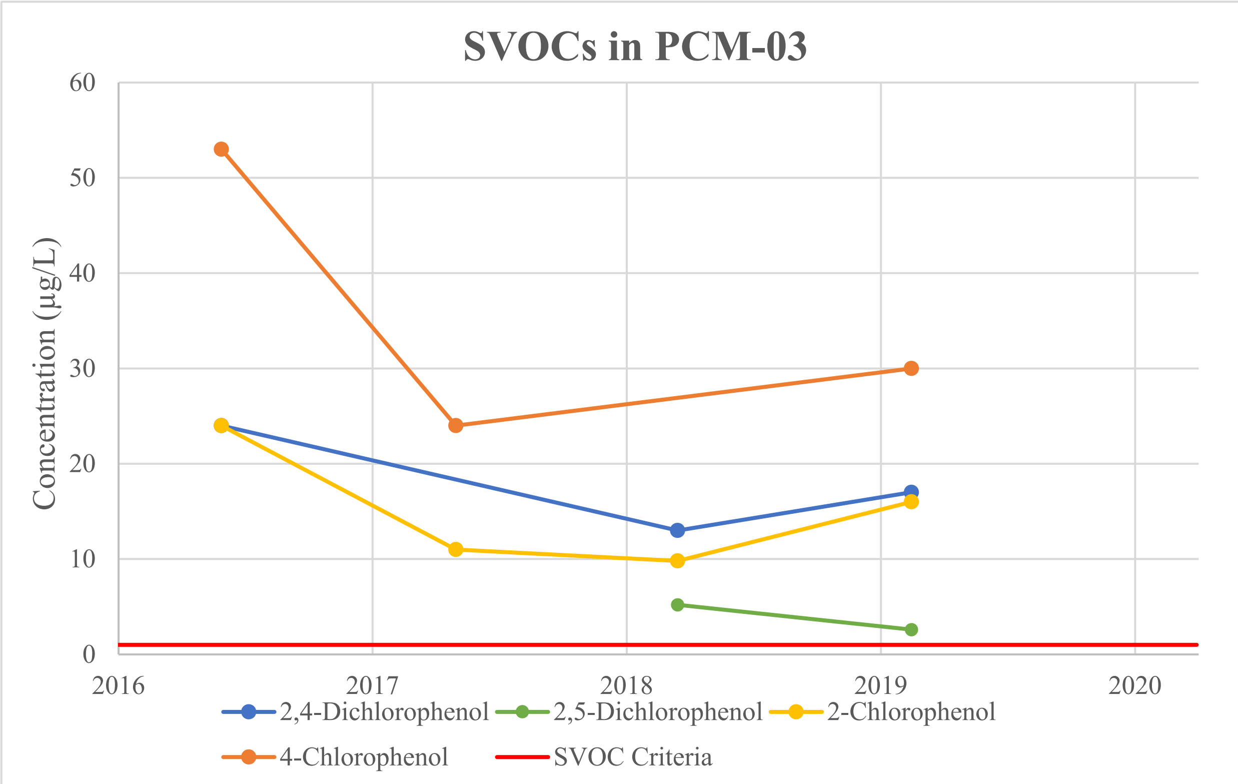
Note: The NYSDEC GA Groundwater Criteria are as follows: 2-Chlorotoluene = 5 µg/L; 1,2-Dichlorobenzene = 3 µg/L; Benzene = 1 µg/L

Figure 5: VOCs in PCM-03



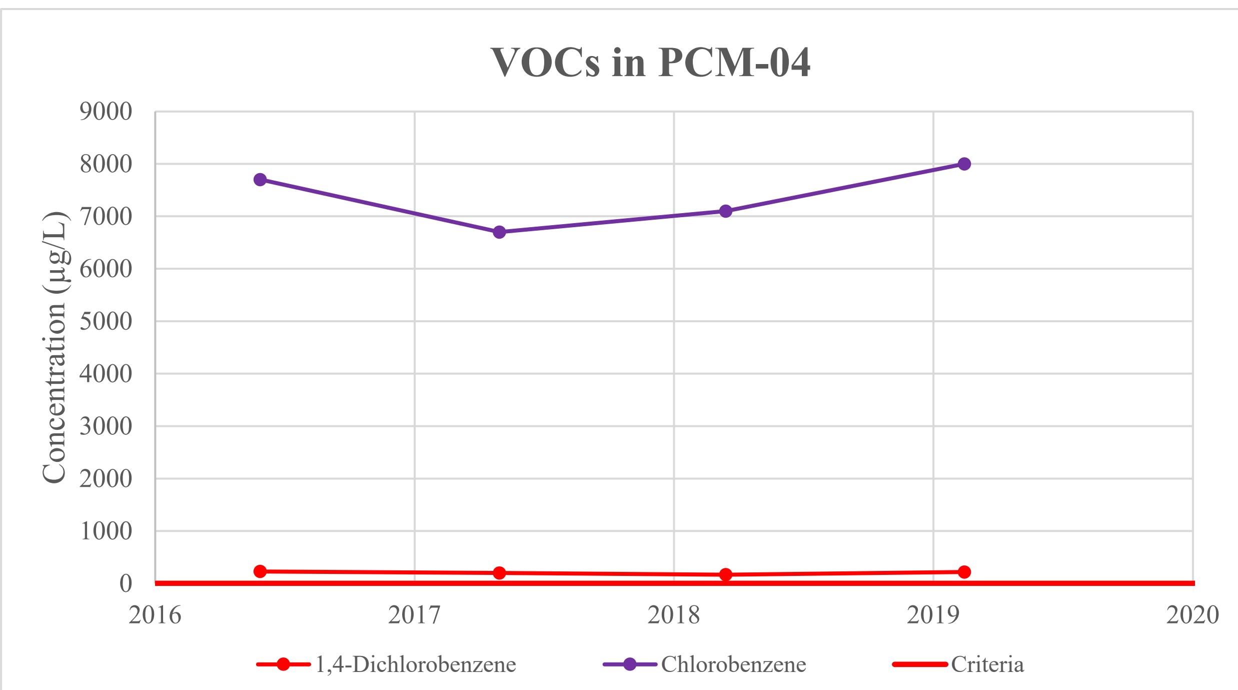
Note: The NYSDEC GA Groundwater Criteria are as follows: 1,4-Dichlorobenzene = 3 µg/L; Chlorobenzene = 5 µg/L

Figure 6: SVOCS in PCM-03



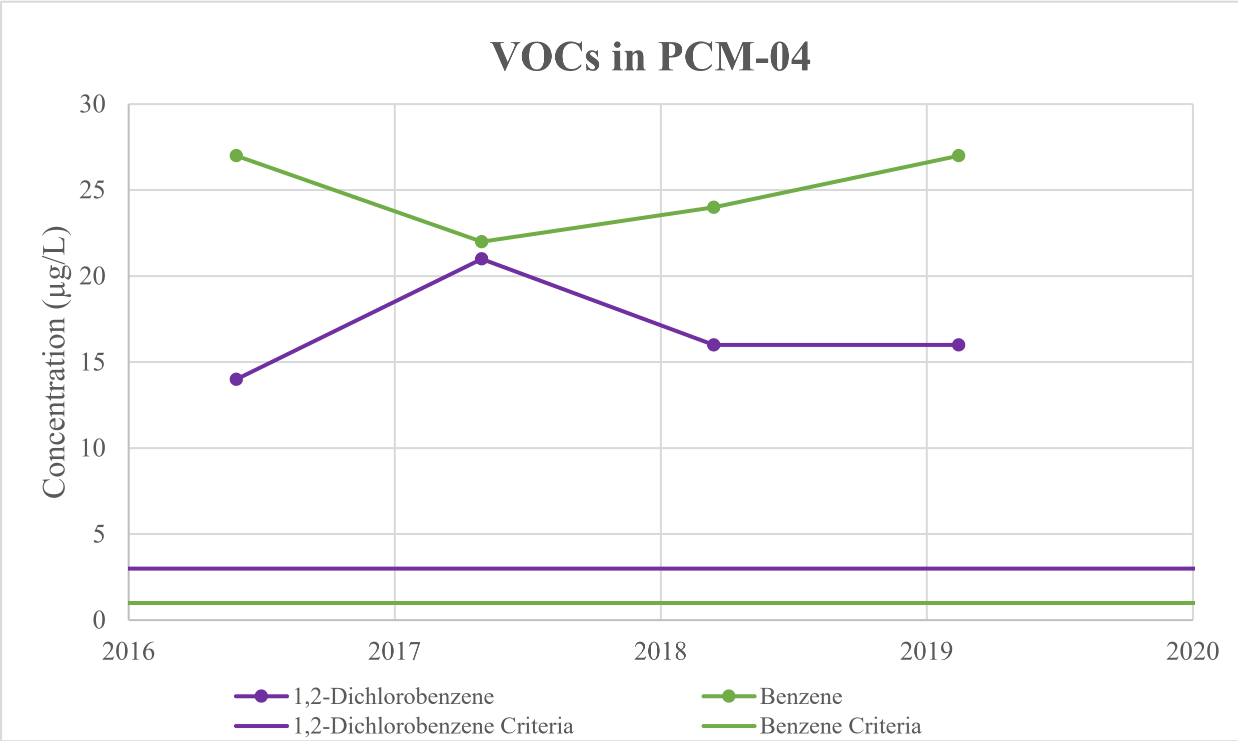
Note: The NYSDEC GA Groundwater Criteria for SVOCs = 1 µg/L

Figure 7: VOCs in PCM-04



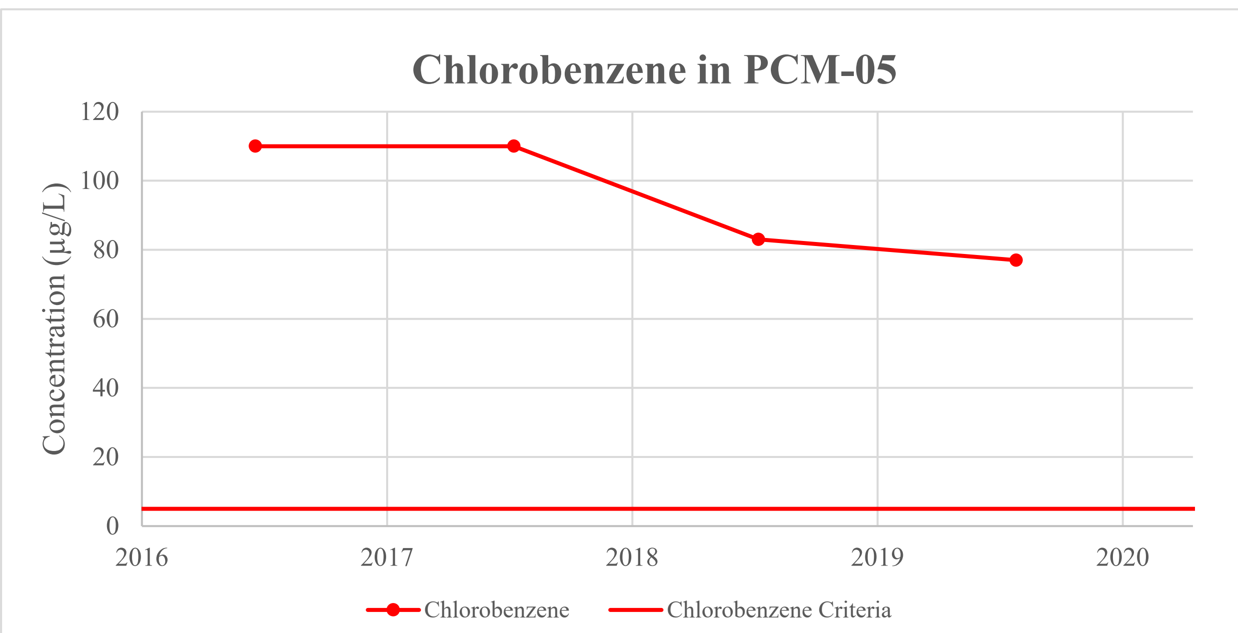
Note: The NYSDEC GA Groundwater Criteria are as follows: 1,4-Dichlorobenzene = 3 µg/L; Chlorobenzene = 5 µg/L

Figure 8: VOCs in PCM-04



Note: The NYSDEC GA Groundwater Criteria are as follows: 1,4-Dichlorobenzene = 3 µg/L; Benzene = 1 µg/L

Figure 9: Chlorobenzene in PCM-05



Note: The NYSDEC GA Groundwater Criteria for Chlorobenzene = 5 µg/L

APPENDIX C – Site Inspection Photos

Figure 10: Perimeter fence.

Figure 11: View of Buffalo Ave.

Figure 12: View of landfill from Buffalo Ave.

Figure 13: View of landfill facing east.

Figure 14: View of the Niagara River south of the landfill.

Figure 15: View of the landfill's eastern fence.

Figure 16: Embankment on the southern edge of the landfill.

Figure 17: Facing east along the landfill's southern edge.

Figure 18: 2,500 gallon skid tanks.

Figure 19: Overlooking the landfill facing east.

Figure 20: Closeup of a NAPL recovery well.

Figure 21: Closeup of a monitoring well on the landfill's southern edge.

Figure 22: A cluster of monitoring wells on the landfill's northern edge.

Figure 23: A cluster of monitoring wells on the eastern edge of the landfill.